

NATIONAL TRANSPORTATION SAFETY BOARD
Public Meeting of May 17, 2016
(Information subject to editing)

Derailment of Amtrak passenger train 188,
Philadelphia, PA, May 12, 2015
NTSB/ DCA15MR010

This is a synopsis from the NTSB's report and does not include the Board's rationale for the conclusions, probable cause, and safety recommendations. NTSB staff is currently making final revisions to the report from which the attached conclusions and safety recommendations have been extracted. The final report and pertinent safety recommendation letters will be distributed to recommendation recipients as soon as possible. The attached information is subject to further review and editing to reflect changes adopted during the Board meeting.

Executive Summary

About 9:21 p.m. eastern daylight time on May 12, 2015, eastbound Amtrak passenger train 188 derailed at milepost 81.62 in Philadelphia, Pennsylvania. The train had just entered the Frankford Junction curve—where the speed is restricted to 50 miles per hour (mph)—at 106 mph. It was dark and 81° F with no precipitation; visibility was 10 miles. As the train entered the curve, the locomotive engineer applied the emergency brakes. Seconds later, the train—one locomotive and seven passenger cars—derailed. There were 245 passengers, 5 on-duty Amtrak employees, and 3 off-duty Amtrak employees on board. Eight passengers were killed, and 185 others were transported to area hospitals.

This report addresses the following safety issues:

- **Crewmember situational awareness and management of multiple tasks.** The NTSB found that the Amtrak engineer accelerated his train to a high rate of speed in a manner consistent with how he habitually manipulated the controls when accelerating to a target speed, suggesting that he was actively operating the train rather than incapacitated moments before the accident. However, he accelerated to 106 mph without slowing the train for the curve at Frankford Junction, where the speed was restricted to 50 mph. After evaluating the circumstances of the accident, the NTSB found that the most likely reason the engineer failed to slow for the curve was he believed he was beyond the curve where the authorized speed was 110 mph, because of his loss of situational awareness. He lost his situational awareness because his attention was diverted to an emergency situation with a nearby SEPTA train that had made an emergency stop after being struck by a projectile. This type of situation could be addressed by better crewmember training that focuses on preventative strategies for situations that could divert crewmember attention.

- **Positive train control.** In the accident area, positive train control had not yet been implemented at the time of the accident, but it has since been implemented. The NTSB found that the accident could have been avoided if positive train control or another control system had been in place to enforce the permanent speed restriction of 50 mph at the Franklin Junction curve.
- **Passenger railcar window systems and occupant protection.** The NTSB found that if the passenger car windows had remained intact and secured in the cars, some passengers would not have been ejected and would likely have survived the accident. Further, the passengers were not protected from serious injuries resulting from being thrown from their seats when the cars overturned. The NTSB concluded that the current passenger equipment safety standards are not adequate.
- **Transportation of the injured after mass casualty incidents.** The NTSB found that, as a result of victims being transported to hospitals without coordination, some hospitals were over utilized while others were significantly underutilized during the response to the derailment. The NTSB further found that current Philadelphia Police Department, Philadelphia Fire Department, and Philadelphia Office of Emergency Management policies and procedures regarding transportation of patients in a mass casualty incident need to be better coordinated.

As a result of this investigation, recommendations were made to Amtrak, the Federal Railroad Administration (FRA), the American Public Transportation Association (APTA), the Association of American Railroads (AAR) Philadelphia Police Department, the Philadelphia Fire Department, the Philadelphia Office of Emergency Management, the Mayor of the City of Philadelphia, the National Association of State EMS Officials, National Volunteer Fire Council, the National Emergency Management Association, the National Association of Emergency Medical Service Physicians, the International Association of Chiefs of Police, and the International Association of Fire Chiefs.

Findings

1. None of the following was a factor in this accident: the mechanical condition of the train, a foreign object striking the locomotive, the condition of the track, the weather, medical conditions of the Amtrak engineer, alcohol or other drugs or any other type of impairment, cell phone use, and fatigue.
2. The Amtrak engineer initially accelerated his train to a high rate of speed in a manner consistent with how he habitually manipulated the controls when accelerating to a target speed, suggesting that he was actively operating the train rather than incapacitated moments before the accident.
3. The Amtrak engineer accelerated the train to 106 miles per hour without slowing the train for the curve at Frankford Junction, due to his loss of situational awareness, likely because his attention was diverted to the emergency situation with the SEPTA train.

4. Training focusing on prospective memory strategies for prolonged, atypical situations that could divert crewmember attention may help operating crews become aware of and take measures to avoid, errors due to memory failure.
5. Cab signal protection to enforce the 50 mile per hour speed restriction in the eastbound direction at Frankford Junction or a fully implemented positive train control system would have prevented the accident.
6. The FRA accident database is inadequate for comparing relevant accident rates based on crew size because the information about accident circumstances and number of crew members in the controlling cab is insufficient.
7. If the passenger car windows had remained intact and secured in the cars, some passengers would not have been ejected and would likely have survived the accident.
8. Passengers were seriously injured by being thrown from their seats when the passenger cars overturned.
9. Although the passenger equipment safety standards in Title 49 *Code of Federal Regulations* Part 238 provide some level of protection for occupants, the current requirements are not adequate to ensure that occupants are protected in some types of accidents.
10. Matching patient arrival to hospital capacity in a mass casualty incident is crucial to ensuring optimal care can be provided for all patients.
11. As a result of victims being transported to hospitals without coordination, some hospitals were overutilized while others were significantly underutilized during the response to the derailment.
12. Transportation of injured victims by police or other municipal vehicles early in a mass casualty incident may be a reasonable use of resources.
13. Current Philadelphia Police Department, Philadelphia Fire Department, and Philadelphia Office of Emergency Management policies regarding transport of patients in a mass casualty incident were not, and still are not, integrated.

PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of the accident was the engineer's acceleration to 106 miles per hour as he entered a curve with a 50 mile per hour speed restriction, due to his loss of situational awareness likely because his attention was diverted to an emergency situation with another train. Contributing to the accident was the lack of a positive train control system.

Contributing to the severity of the injuries was the inadequate requirements for occupant protection in the event of a train overturning.

RECOMMENDATIONS

New Recommendations

Based on its investigation, the National Transportation Safety Board issues the following new safety recommendations:

To the Federal Railroad Administration:

1. Require railroads to install devices and develop procedures that will help crewmembers identify their current location and display their upcoming route in territories where positive train control will not be implemented.
2. Modify form 6180.54 (Rail Equipment Accident/Incident Report) to include the number of crewmembers in the controlling cab of the train at the time of an accident.
3. After form 6180.54 is modified as specified in Safety Recommendation [2], use the data regarding number of crewmembers in the controlling cab of the train at the time of an accident to evaluate the safety adequacy of current crew size regulations.
4. Conduct research to evaluate the causes of passenger injuries in passenger railcar derailments and overturns and evaluate potential methods for mitigating those injuries, such as installing seat belts in railcars and securing potential projectiles.
5. When the research specified in Safety Recommendation [4] identifies safety improvements, use the findings to develop occupant protection standards for passenger railcars to mitigate passenger injuries likely to occur during derailments and overturns.

To Amtrak:

6. Incorporate strategies into your initial and recurrent training for operating crewmembers for recognizing and effectively managing multiple concurrent tasks in prolonged, atypical situations to sustain their attention on current and upcoming train operations.

To the American Public Transportation Association and the Association of American Railroads:

7. Develop criteria for initial and recurrent training for operating crewmembers that reinforce strategies for recognizing and effectively managing multiple concurrent tasks and prolonged, atypical situations to sustain their attention on current and upcoming train operations, and distribute those criteria to your members.

To Philadelphia Police Department, the Philadelphia Fire Department, and Philadelphia Office of Emergency Management:

8. Collaborate and develop a plan that effectively integrates rapid police transport of patients into the emergency medical response plans for large mass casualty incidents, including a means of coordinating hospital destinations regardless of the method of transport.
9. Once the plan specified in Safety Recommendation [8] is developed, practice the plan periodically, including at least one full-scale drill every 3 years, to ensure that it functions as intended.

To the Mayor of the City of Philadelphia:

10. Facilitate the collaboration among the Philadelphia Police Department, Philadelphia Fire Department, and Office of Emergency Management, to develop a plan that effectively integrates police transport of patients into the emergency medical response plans for large mass casualty incidents, and to practice the plan periodically, including at least one full-scale drill every 3 years.

To the National Association of State EMS Officials, National Volunteer Fire Council, National Emergency Management Association, National Association of Emergency Medical Service Physicians, International Association of Chiefs of Police, and International Association of Fire Chiefs:

11. Educate your members regarding the details of this accident including the lessons learned from the emergency medical response and the potential utility of integrating police transport of victims into mass casualty incident response plans.

Previously Issued Recommendations Arising from this Accident

On July 8, 2015, the NTSB issued the following recommendations to Amtrak:

Install, in all controlling locomotive cabs and cab car operating compartments, crash- and fire-protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train operating conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and system wide performance monitoring programs. (R-15-28)

Semi-annually, issue a public report detailing Amtrak's progress in installing crash-and fire-protected inward-and outward-facing audio and image recorders. The report should include

the number of locomotives and cab car operating compartments that have been equipped with the recorders, as well as the number of locomotives and cab car operating compartments in Amtrak's fleet that still lack those devices. (R-15-29)

Regularly review and use in-cab audio and image recordings in conjunction with other performance data to verify crew member actions are in accordance with rules and procedures that are essential to safety. (R-15-30)

On July 8, 2015, the NTSB also reiterated the following previously issued recommendations to the FRA asking it to require inward-facing cameras:

Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash- and fire-protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train operating conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and system wide performance monitoring programs. (R-10-1)

Require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. (R-10-2)

Previously Issued Recommendations Reiterated in this Report

To the Federal Railroad Administration:

Develop a performance standard to ensure that windows (e.g., glazing, gaskets, and any retention hardware) are retained in the window opening structure during an accident and incorporate the standard into 49 *Code of Federal Regulations* (CFR) 238.221 and 49 CFR 238.421 to require that passenger railcars meet this standard. (R-14-74)

Previously-Issued Recommendations Classified in this Report

Safety recommendations R-15-28 through -30 are classified "Open—Acceptable Response" in section 2.1 of this report.

Install, in all controlling locomotive cabs and cab car operating compartments, crash-and fire-protected inward-and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train operating conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or

for use by management in carrying out efficiency testing and system wide performance monitoring programs. (R-15-28)

Semi-annually, issue a public report detailing Amtrak's progress in installing crash-and fire-protected inward-and outward-facing audio and image recorders. The report should include the number of locomotives and cab car operating compartments that have been equipped with the recorders, as well as the number of locomotives and cab car operating compartments in Amtrak's fleet that still lack those devices. (R-15-29)

Regularly review and use in-cab audio and image recordings in conjunction with other performance data to verify crew member actions are in accordance with rules and procedures that are essential to safety. (R-15-30)

Safety Recommendation R-13-23 is classified "Closed – Acceptable Alternate Response" in section 1.5.1 of this report.

Publish the positive train control implementation update reports submitted by all railroads subject to the positive train control provisions of the Rail Safety Improvement Act of 2008 and make the reports available on your website within 30 days of report receipt. (R-13-23)